**Rates of Reaction (Level 2) examiners tips: Read these please!**

Answers on Rate of Reaction require explicit detail to be written about collision theory

• name the specific particles involved in the reaction eg *hydrochloric acid* as opposed to just acid

• **concentration**

eg. a higher concentration

so there are more reactant particles in the same volume  
so the frequency of collisions increases per unit time

So, the Rate of Reaction increases

• **temperature**  
at a lower temperature, fewer particles have enough kinetic energy to overcome the Activation Energy barrier.  
eg. at a higher temperature so the particles gain kinetic energy and are moving faster,  
therefore there is an increase in frequency of collisions between particles per unit time

**and**

particles also collide more effectively*(effectiveness of collisions has a greater effect than frequency of collisions)*

as the particles have more kinetic energy to overcome the Activation Energy  
So, the Rate of Reaction increases

• if you mention **Activation Energy** then define it as the minimum kinetic energy for collisions to be successful

• **surface area**  
eg solid marble chips (CaCO3) is crushed to a smaller size

so the CaCO3 has a greater surface area,

there are more particles of the solid substance eg CaCO3 exposed for attack by the acid eg HCl  
therefore there is an increase in frequency of collisions between particles per unit time

So, the Rate of Reaction increases

• **catalyst**

a catalyst is not used up in a reaction but speeds up the rate of a reaction.  
a catalyst allows more successful/effective collisions

to occur per unit time

by lowering the Activation Energy.

This is because the catalyst has provided an alternative pathway.

So, the Rate of Reaction increases

**Also…”don’t be daft”, what NOT to do**

increase/decreasing heat (NO! use the word TEMPERATURE)  
adding water (NO! again far too vague, use the term CONCENTRATION (*of a named substance*)  
for a temperature increase particles DO NOT reach the Activation Energy EARLIER, what actually happens is that "MORE particles have kinetic energy GREATER than the Activation Energy"  
particles never have more activation energy but KINETIC ENERGY  
refer to particles colliding with more ENERGY, never force  
note that for Excellence "EFFECTIVENESS of the collisions has a greater effect than frequency of collisions"  
for all factors, it is important to refer to the increase/decrease in FREQUENCY of collisions PER UNIT TIME  
refer to the rate of reaction INCREASING/DECREASING, never quicker/slower  
collision rate increases/decreases PER UNIT TIME

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